

Science Bowl Questions 1994

Round 5

Toss-Up

1. GENR; Multiple Choice: What size incandescent bulb produces about the same amount of light as an 18-watt compact fluorescent light bulb?
 - a) 25-watt
 - b) 40-watt
 - c) 60-watt
 - d) 75-watt

ANSWER: D – 75-WATT

Bonus

1. GENR; Short Answer: What is the name of the first nuclear-powered aircraft carrier?

ANSWER: ENTERPRISE

Toss-Up

2. PHYS; Multiple Choice: The work done by a conservative force between two points is:
 - a) always positive
 - b) always independent of the path
 - c) always dependent upon the time
 - d) zero

ANSWER: ENTERPRISE

Bonus

2. PHYS; Multiple Choice: A body of mass 5kg moves in simple harmonic motion according to the equation $X = 0.04 \sin(30t)$ where all units are SI. The maximum speed of this body is approximately:
 - a) 0.013 meters/second
 - b) 0.40 meters/second
 - c) 0.60 meters/second
 - d) 1.2 meters/second

ANSWER: D – 1.2 METERS/SECOND

Toss-Up

3. BIOL; Multiple Choice: In past years, the bacteria were considered part of the plant kingdom. Now, most bacterial systematists formally place the true bacteria (exclusive of the archae) in a kingdom called:
- a) Protista (pron. Pro-tis' -ta)
 - b) Schizomycetae (pron. skit-zo-my-see' -tee)
 - c) Eucaroyotae (pron. u'-kair-e-uh-tee)
 - d) Procaryotae or Monera (pron. pro'-kair-e-uh-tee)

ANSWER: B – MEMBRANE-BOUND ORGANELLES

Bonus

3. BIOL; Multiple Choice: Bacteria differ from other types of cells because bacteria do not contain:
- a) ribosomes
 - b) membrane-bound organelles
 - c) both DNA and RNA
 - d) carbohydrates

ANSWER: B – MEMBRANE-BOUND ORGANELLES

Toss-Up

4. ASTR; Multiple Choice: The total amount of radiation emitted per square centimeter by any object depends on which of these:
- a) temperature
 - b) composition
 - c) density
 - d) size

ANSWER: A – TEMPERATURE

Bonus

4. ASTR; Multiple Choice: A certain star has the celestial coordinates of 45 degrees declination, 6 hours right ascension. What are the coordinates of the star that is farthest away from it on the celestial sphere?
- a) (0 degrees declination, 0 hours right ascension)
 - b) (-45 degrees declination, 6 hours right ascension)
 - c) (-45 degrees declination, 18 hours right ascension)
 - d) (+45 degrees declination, 18 hours right ascension)

ANSWER: C – -45 DEGREES DECLINATION, 18 HOURS RIGHT ASCENSION

Toss-Up

5. CHEM; Multiple Choice: Identify which of the following pHs would use the Ammonium/Ammonia buffer system to prepare an effective buffer:
- a) 4.0
 - b) 5.0
 - c) 7.0
 - d) none of the above

ANSWER: D – NONE OF THE ABOVE

Bonus

5. CHEM; Multiple Choice: What would be the pH of a solution in which the concentrations of Ammonium and Ammonia are equal?
- a) 7.25
 - b) 9.25
 - c) 11.25
 - d) 13.25

ANSWER: B – 9.25

Toss-Up

6. COMP; Multiple Choice: The ability of a communication line to both transmit and receive simultaneously is known as:
- a) simplex
 - b) half duplex
 - c) full duplex
 - d) complex

ANSWER: C – FULL DUPLEX

Bonus

6. COMP; Short Answer: What is the name given to the ability of a computer to understand and process spoken commands?

ANSWER: NATURAL LANGUAGE PROCESSING OR NLP (ACCEPT SPEECH RECOGNITION)

Toss-Up

7. BIOL; Multiple Choice: Blue-green algae, also called cyanobacteria differ from eucaryotic algae because cyanobacteria do not:
- a) make oxygen
 - b) contain chlorophyll a
 - c) form colonies
 - d) contain chloroplasts

ANSWER: D – CONTAIN CHLOROPLASTS

Bonus

7. BIOL; Multiple Choice: Three structures found in eucaryotic cells that are absent in prokaryotes are:
- a) endoplasmic reticulum, flagella, nucleus
 - b) mitochondria, ribosomes, nucleus
 - c) Golgi apparatus, mitochondria, nucleus
 - d) centriole, ribosomes, flagella

ANSWER: C – GOLGI APPARATUS, MITOCHONDRIA, NUCLEUS

Toss-Up

8. PHYS; Multiple Choice: Two unequal masses hang from either end of a massless cord that passes over a frictionless pulley. Which of the following is true about the gravitational potential energy U and the kinetic energy K of the system after the masses are released from rest?
- a) $\Delta U < 0$ and $\Delta K > 0$
 - b) $\Delta U = 0$ and $\Delta K > 0$
 - c) $\Delta U < 0$ and $\Delta K = 0$
 - d) $\Delta U > 0$ and $\Delta K < 0$

ANSWER: A – $\Delta U < 0$ AND $\Delta K > 0$

Bonus

8. PHYS; Multiple Choice: An ice skater goes into a spin and draws the arms in. The person spins faster because
- a) the angular momentum is increasing
 - b) the skater's moment of inertia is decreasing
 - c) the skater has an outside force acting on the body
 - d) the angular momentum and moment of inertia are increasing

ANSWER: B – THE SKATER'S MOMENT OF INERTIA IS DECREASING

Toss-Up

9. ERSC; Short Answer: What was the primary geologic phenomenon in the creation of the current geomorphology of the northern United States and Canada?

ANSWER: GLACIATION (OR GLACIERS)

Bonus

9. ERSC; Multiple Choice: The percentage of the earth's land surface now covered by glacial ice is:

- a) 3%
- b) 5%
- c) 10%
- d) 20%

ANSWER: C – 10%

Toss-Up

10. CHEM; Multiple Choice: Which of the following molecules is paramagnetic?

- a) Fluorine
- b) Nitrogen
- c) Hydrogen
- d) Nitric oxide

ANSWER: D – NITRIC OXIDE

Bonus

10. CHEM; Multiple Choice: Which of the following theories correctly predicts the magnetic properties of elemental oxygen?

- a) Molecular Orbital Theory
- b) VSEPR Theory
- c) Valence Bond Theory
- d) all of the above

ANSWER: A – MOLECULAR ORBITAL THEORY

Toss-Up

11. BIOL; Multiple Choice: Bacteria which derive their energy from the sun and their reducing power from inorganic chemicals are said to be:

- a) photoheterotrophic
- b) chemoheterotrophic
- c) photolithotrophic
- d) chemolithotrophic

ANSWER: C - PHOTOLITHOTROPHIC

Bonus

11. BIOL; Multiple Choice: Most bacteria possess a cell wall that contains a backbone of unusual sugars and side chains of amino acids, including D-alanine. The sugar derivative that is unique to bacteria is:

- a) N-acetylmuramic acid
- b) N-acetylglucosamine
- c) diaminopimelic acid
- d) cellobiose

ANSWER: A – N-ACETYLMURAMIC ACID

Toss-Up

12. CHEM; Short Answer: Name the alloy that contains about 10 percent tin and 90 percent copper.

ANSWER: BRONZE

Bonus

12. CHEM; Multiple Choice: Which of the following ores does NOT contain copper?

- a) azurite
- b) chalcopyrite
- c) rutile
- d) bornite

ANSWER: C – RUTILE

Toss-Up

13. MATH; Short Answer: Suppose that a circle, a square, a triangle, and a rhombus all have the same perimeter. Which shape encloses the greatest area

ANSWER: A CIRCLE

Bonus

13. MATH; Multiple Choice: Which of the following is an acceptable definition of a hyperbola?
- a) the locus of points P for which the sum of the distances from the two foci is constant
 - b) the locus of points P for which the differences of the distances from the two foci is constant
 - c) the locus of points P for which the distance from the center is constant
 - d) the locus of points P which are at an equal distance from the directrix and the focus

ANSWER: B – THE LOCUS OF POINTS P FOR WHICH THE DIFFERENCES OF THE DISTANCES FROM THE TWO FOCI IS CONSTANT

Toss-Up

14. GENR; Short Answer: What was the first device invented to measure nuclear radiation?

ANSWER: A GEIGER COUNTER

Bonus

14. GENR; Multiple Choice: On average, what percentage of their total annual radiation exposure do Americans receive from nuclear power industry operations
- a) less than 1 percent
 - b) about 5 percent
 - c) 10 percent
 - d) more than 20 percent

ANSWER: A – LESS THAN 1 PERCENT

Toss-Up

15. BIOL; Multiple Choice: When a bacteriophage is used to introduce foreign DNA into a host bacterium, that bacteriophage is a:

- a) plasmid
- b) vector
- c) lysogenic agent
- d) community

ANSWER: D - COMMUNITY

Bonus

15. BIOL; Multiple Choice: An assemblage of different microbial species living together in a defined habitat is called a:

- a) population
- b) cluster
- c) epitome
- d) community

ANSWER: D - COMMUNITY

Toss-Up

16. ASTR; Multiple Choice: The Doppler shift is a measure of a star's:

- a) temperature
- b) radial velocity
- c) mass
- d) community

ANSWER: D – COMMUNITY

Bonus

16. ASTR; Multiple Choice: You are an astronomer who would like to observe a developing proto-star. Which of the following instruments would you find most useful to find a star embedded in gas and dust?

- a) The Infrared Astronomical Observatory
- b) A balloon-launched gamma-ray telescope
- c) The 200-inch optical Hale telescope on Mt. Palomar
- d) The McMath Solar Telescope on Kitt Peak

ANSWER: A – THE INFRARED ASTRONOMICAL OBSERVATORY

Toss-Up

17. PHYS; Multiple Choice: The total mechanical energy of any system is:

- a) always the work done by gravity
- b) the difference between the kinetic and potential energy at any point
- c) the sum of the translational and rotational kinetic energies at any point
- d) the sum of the kinetic and potential energy at any point

ANSWER: D – THE SUM OF THE KINETIC AND POTENTIAL ENERGY AT ANY POINT

Bonus

17. PHYS; Short Answer: During World War II, the use of radio frequency electromagnetic waves to detect distant targets played a significant role in the outcome of the war. This technology is referred to as radar. What does RADAR stand for?

ANSWER: RADIO ASSISTED DETECTION AND RANGING

Toss-Up

18. CHEM; Multiple Choice: Colligative properties observed with dilute solutions depend on the collective effects of dissolved solute. Identify the type of dissolved solute.

- a) atoms
- b) ions
- c) particles
- d) molecules

ANSWER: C - PARTICLES

Bonus

18. CHEM; Multiple Choice: Short Answer: Which of the four colligative properties is MOST SENSITIVE to the amount of solute present in a solution?

ANSWER: OSMOTIC PRESSURE

Toss-Up

19. ERSC; Multiple Choice: Which of the following are Jurassic dinosaurs?

- a) Diplodocus and Stegosaurus
- b) Allosaurus and Triceratops
- c) Tyrannosaurus Rex and Triceratops
- d) Diplodocus and Iguanodon

ANSWER: A – DIPLODOCUS AND STEGOSAURUS

Bonus

19. ERSC; Multiple choice: If all the earth's glacial ice melted, the sea level would rise:

- a) 18 feet
- b) 60 feet
- c) 330 feet
- d) 960 feet

ANSWER: C – 330 FEET

Toss-Up

20. COMP; Multiple Choice: Which of the following storage devices is most frequently associated with storing the most data?

- a) nine track tape
- b) 5-1/4" floppy drive
- c) hard disk
- d) optical disk

ANSWER: D – OPTICAL DISK

Bonus

20. COMP; Short Answer: What is the term given to types of devices which can be connected together in "daisy chain" fashion?

ANSWER: A SCSI (PRONOUNCED SCUZZY) OR SMALL COMPUTER SYSTEM INTERFACE

Toss-Up

21. BIOL; Multiple Choice: Name the electron transport process in which the inorganic chemical nitrate can be used by many bacteria as a terminal acceptor of electrons.

- a) respiration
- b) fermentation
- c) ammonification
- d) anaerobic respiration

ANSWER: D – ANAEROBIC RESPIRATION

Bonus

21. BIOL; Multiple Choice: The unusual bacteria in thermal vents and other hot environments are called:

- a) methylotrophs
- b) archaeobacteria
- c) actinomycetes
- d) vibrios

ANSWER: B - ARCHAEBACTERIA

Toss-Up

22. MATH; Short Answer: Give the first 8 numbers in a Fibonacci sequence:

ANSWER: 1, 1, 2, 3, 5, 8, 13, 21

Bonus

22. MATH; Short Answer: As the Fibonacci numbers get larger, the ratio of each number to its preceding number approaches the value 1.618. What is this number called in art and architecture?

ANSWER: GOLDEN RATIO (GOLDEN SECTION)

Toss-Up

23. PHYS; Multiple Choice: Which of the following is true?

- a) friction is a conservative force and does negative work
- b) the work done by a conservative force between two points depends on the path taken between those points
- c) a conservative force cannot change a body's total energy
- d) the work done by a conservative force while a body moves at constant velocity must be zero

ANSWER: C – A CONSERVATIVE FORCE CANNOT CHANGE A BODY'S TOTAL ENERGY

Bonus

23. PHYS; Multiple Choice: Which of the following is not a source of fast electrons:

- a) Beta Decay
- b) Internal Conversions
- c) Auger electrons (pron. o-zhay')
- d) Alpha Decay

ANSWER: D – ALPHA DECAY

Toss-Up

24. CHEM; Multiple Choice: In an adiabatic bomb calorimeter, reactions are carried out under which of the following conditions:

- a) fixed pressure
- b) fixed volume
- c) constant rate
- d) constant temperature

ANSWER: B – FIXED VOLUME

Bonus

24. CHEM; Short Answer: What is the name for processes that take place at constant pressure?

ANSWER: ISOBARIC

Toss-Up

25. PHYS; Short Answer: Name the most efficient, in theory, thermodynamic cycle.

ANSWER: CARNOT CYCLE (PRON: Car-no)

Bonus

25. PHYS; Multiple Choice: Efficiency increases in a Carnot Cycle when:

- a) the temperatures of the two heat reservoirs converge
- b) the temperatures of the two heat reservoirs diverge
- c) the rate of the cycle increases
- d) the rate of the cycle decreases

ANSWER: B – THE TEMPERATURES OF THE TWO HEAT RESERVOIRS DIVERGE
